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Acute respiratory distress syndrome in COVID-19

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Abstract

Emerging coronavirus-related respiratory disease started from Wuhan, China in December 2019 resulted in numerous mortality following acute respiratory distress syndrome (ARDS) named COVID-19 disease. The incubation period of COVID-19 is varied from 2 days to 2 weeks; therefore oral transmission is the most hazardous issue in this incubation period. Scientists are trying to find a specific drug to treat COVID-19 disease, however there is no specific therapy yet. One of the challenging issues in the treatment process of these patients is ARDS. In the development of any type of pneumonia or ARDS, Covid-19 should be considered as an option for differential diagnosis and the first critical organ in these patients is lung. In this paper, we discussed ARDS in patients with COVID-19.

Keywords: COVID-19, Coronavirus Pneumonia, Infection, 2019 novel coronavirus, Acute respiratory distress syndrome

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Nowadays, people are facing with lethal emerging respiratory disease started from Wuhan, China in December 2019. The 2019 novel coronavirus or 2019-nCoV infection rapidly spread in the world (1). The name of this respiratory disease was selected COVID-19 by world health organization (2). COVID-19 causes both pneumonia and respiratory symptoms while respiratory rate more than 30 per minute needs mechanical ventilation in the intensive care units (3). Emergency intubation is a vital action following severe pneumonia caused by COVID-19 and it is essential to be conducted by a skilled anesthesiologist to manage the necessary settings in ventilator machines such as the arrangement of positive end-expiratory pressure (PEEP) and fraction of inspired oxygen (Fio2) (4). As shown, the vital organ in COVID-19 is lung therefore the main pathway for human-to-human transmission is through droplets and the origin of receiving oxygen devices (5). The incubation period of COVID-19 is varied from 2 days to 2 weeks; accordingly oral transmission is the most hazardous issue (5). COVID-19 can involve the population of fewer 18 years while almost does not result in death because children are resistant to this infection (6). However, some children were admitted to China due to COVID-19 were below 17 years or less (7). Fortunately, the majority of patients due to the low fatality rate of COVID-19 experience mild symptoms without lung involvement (8). In patients with severe symptoms, Kaletra showed significant effect to reduce the respiratory symptoms during the treatment. Therefore, this drug is suggested to be used in high-risk patients with other comorbidities (9). Moreover, other several drugs such as chloroquine and remdesivir are passing the final steps to be administered in human beings in China (10). Influenza causes pneumonia in a short time while the duration between the development of COVID-19 and respiratory failure is longer than seven days in at-risk patients (11). Recently Li et al showed that the mean duration from COVID-19 development to physician visits was 12.5 days. Accordingly, patients with severe respiratory symptoms in a mean of 5.8 days should be intubated (12). To assess the clinical characteristics of COVID-19 infection, Chang et al showed

that 61.5% of patients had upper airway congestion. Cough was found in 46.2% of the patients with COVID-19, may then lasted by 8.33 days on average. Rhinorrhea is a rare symptom however; one patient reported rhinorrhea along with COVID-19 (13). According to the World Health Organization, the most common respiratory symptom of COVID-19 is dry cough. Other respiratory symptoms are nasal congestion, runny nose, sore throat and difficult breathing (14). To manage acute respiratory distress syndrome which presented by bilateral opacities in radiologic graphs, the following protocol can be used for oxygenation impairment in adults;

- Mild ARDS: 200 mm Hg < PaO2/FiO2 a ≤ 300 mm Hg [with PEEP or continuous positive airway pressure (CPAP) ≥ 5 cmH2O, or non-ventilated]
- Moderate ARDS: 100 mm Hg < PaO2/FiO2 ≤ 200 mm Hg (with PEEP ≥ 5 cmH2O, or non-ventilated)
- Severe ARDS: PaO2/FiO2 ≤ 100 mm Hg (with PEEP ≥ 5 cmH2O, or non-ventilated)
- When PaO2 is not available, SpO2/FiO2 ≤315 suggests ARDS (including in non-ventilated patients)

Accordingly for oxygenation impairment in children the following protocol can be used:

- Use PaO2-based metric when available. If PaO2 not available, wean FiO2 to maintain SpO2 ≤97% to calculate OSI or SpO2/FiO2 ratio.
- Bilevel (NIV or CPAP) ≥ 5 cmH2O via full face mask; PaO2/FiO2 ≤ 300 mm Hg or SpO2/FiO2 ≤ 264
- Mild ARDS (invasively ventilated); 4 ≤ OI < 8 or 5 ≤ OSI <7.5
- Moderate ARDS (invasively ventilated); 8 ≤ OI <16 or 7.5 ≤ OSI <12.3
- Severe ARDS (invasively ventilated); OI ≥16 or OSI ≥12.3 (15).

Additionally, it should be considered that some patients do not respond to the non-mechanical support and have a short and rapid breath. In this regard, they usually require mechanical ventilation (16). It should be mentioned that pre-oxygenation with 100% FiO2 for five minutes is mandatory to inhibit the reduction of O_2 saturation (17). Lower tidal volumes (4–8 mL/kg) and lower inspiratory pressures (plateau pressure <30 cmH2O) are appropriate modalities for this condition since the time duration of mechanical ventilation should be short. Moreover in some protocols, it is strongly recommended to reduce the time of mechanical ventilation (16). Regarding medication, glucocorticoids are not recommended and antibiotics are needed for secondary bacterial infections (17).

In brief, the management of ARDS is important to survive affected patients and should be taken into account by relevant specialists.

Authors' contribution

ND and MMR designed the study. RV and SF supervised the project. RV and ND wrote the paper. All authors edited and revised the final manuscript and accepted its publication.

Conflicts of interest

The authors declared no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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